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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

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Revision of the Claopodiums.*

By G. N. Best.

Claopodium as a subgenus under *Hypnum* was established by Lesquereux and James† to include a few species found only in the northwestern portion of the United States and the extreme southwestern portions of British America.

The *Claopodiums* occupy a position midway between the *Anomodons* on the one hand and the *Thuidiums* on the other, differing from the former by their hypnoid capsules, from the latter by the absence of filamentose paraphyllia and from both by their thickened-papillate leaf-cells. Although closely related to both of these genera it seems impossible to connect *Claopodium* with either without doing injustice to its affinities. The better way therefore is to allow it generic rank, as has already been done by Renauld & Cardot, which it deserves equally as well as either *Anomodon* or *Thuidium*.

CLAOPODIUM Ren. & Card. Musc. Am. Sept. 50. 1893.

Plant small to quite large, growing on the ground, stones, rocks or base of trees. Stems creeping, radiculose, stoloniferous; paraphyllia when present squamiform; stem leaves triangular to broadly ovate, long and narrowly acuminate, margins plane, dentate-serrate, costa translucent; leaf-cells small, round-hexagonal to rhombic, thickened-papillate on both surfaces; dioicous; pedicels roughened; capsule horizontal; annulus compound; cilia one to three; operculum long-conic to conic-rostrate; calyptra cucullate; spores small, smooth.

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* Based chiefly on specimens furnished by Columbia University, the Geological Survey of Canada and by Mr. M. A. Howe. I am indebted to Mrs. Britton for valuable assistance in verifying synonyms and citations and in securing types.

† Mosses of North America, 327. 1884.

Key to Species.

Plants small; leaf-cells rhombic; leaves not hair-pointed.
  Plants dark green; leaves of terminal branches loosely spreading, two-ranked. 1. *Whippleanum.*
  Plants yellow-green; leaves of terminal branches erect-spreading, not two-ranked. 2. *leuconeurum.*
Plants larger; leaf-cells round-hexagonal; leaves hair-pointed.
  Leaf-cells stoutly unipapillate. 3. *crispifolium.*
  Leaf-cells pluripapillate; papillae small. 4. *Bolanderi.*

1. CLAOPODIUM WHIPPLEANUM (Sulliv.) R. & C.

Hypnum Whippleanum Sulliv. Pac. R. R. Rep. 4: 190. 1856.
Thuidium leskeoides Kindb. Bull. Torr. Club, 17: 277. 1890.
Claopodium Whippleanum R. & C. Musc. Am. Sept. 50. 1892.

In spreading mats, deep to dark green; stem 2–4 cm. long, creeping, stoloniferous, flagellate, irregularly pinnately branched; stem leaves triangular to ovate-lanceolate, narrowly acuminate, subdecurrent; margins plane, dentate below, sharply serrate above; costa subpercurrent; leaf cells linear-rhomboidal below, irregularly quadrate-oblong at basal angles, indistinctly rhombic above, usually densely thickened-papillate; marginal curvilinear, echlorophyllose; paraphyllia absent; terminal branches complanate-foliate, leaves loosely spreading, narrowly lanceolate, indistinctly two-ranked; perichetial bracts oblong-lanceolate, filiform acuminate, flexuous, denticulate-serrate, inner lightly costate; pedicel roughened, subcygneus; capsule oblong-oval, rough, collum distinct, horizontal, subpendant when empty; annulus early deciduous; teeth whitish; cilia 1–3, nearly or quite as long as teeth; operculum broadly conic, short beaked; spores .009–.011; matures in spring.

Shady clay ground, rarely on base of trees. Vancouver Island (Macoun); California, coast ranges (Bigelow, Bolander, Howe)!

Type from California in Coll. Sullivant, Gray herbarium.

ILLUST.—Sulliv. Pacif. R. R. Report, 4: *pl. 9*. In part. 1856.

EXSIC.—S. & L. Musc. Bor. Am. ed. 2, no. 407.

REM.—Rudimentary leaves, nearly destitute of papillae, with leaf-cells linear-rhomboidal and costa vanishing in the middle, are not infrequent on stolons and flagellae.

2. CLAOPODIUM LEUCONEURUM (S. &. L.) R. & C.

Thuidium leuconeurum S. & L. in Sulliv. Icon. Musc. Supp. 104. 1874.

Hypnum leuconeurum L. & J. Mosses of N. A. 328. 1884.

Claopodium leuconeurum Ren. & Card. Musc. Am. Sept. 50. 1892.

In compact spreading tufts, yellow-green; stems 2–3 cm. long; leaves of terminal branches appressed when dry, erect-spreading when moist, lanceolate, not two-ranked; inner perichetial bracts scarcely costate; pedicel minutely roughened (smooth ?); capsule small, oval; operculum long conic; in other respects as in *Claopodium Whippleanum*, of which it appears to be a depauperate form, growing in drier situations; matures in early spring.

On the ground and base of trees. California (Bigelow, Bolander, Howe).

Type locality California. Type in Coll. Sullivant, Gray Herbarium.

ILLUST.—Sulliv. Pacif. R. R. Report, 4: *pl. 9*, in part (1856); Sulliv. Icon. Musc. Supp. *pl. 80* (1874).

EXSIC.—S. & L. Musc. Bor. Am., 2 ed. No. 407^b.

REM.—A careful study of considerable material, including Nos. 407 and 407^b of S. & L. Musc. Bor. Am., and also the types of *C. Whippleanum* and *C. leuconeurum*, kindly loaned me by Dr. B. L. Robinson, from the Sullivant Collection in the Gray Herbarium, shows but little ground for their separation. In the notes which accompany the types Sullivant admits that "they are very similar," "they grow mixed together," "*Hypnum Whippleanum* may have an annulus," and that "it is difficult to distinguish them without the fruit." The character on which he puts most stress is, as he claims, the rough pedicel of the former and the smooth pedicel of the latter. I have been unable to verify the correctness of this observation, as I find the pedicels in both more or less roughened, simply a difference in degree; in the types this difference is inappreciable.

Sullivant also claims that the leaves in *C. leuconeurum* are not "bifariously disposed" as in *C. Whippleanum*. The leaves of the stems and primary branches are not bifarious in either, but somewhat evenly distributed; it is only the true terminal branches that show this peculiar phyllotaxis. In the less developed forms these are either absent, which is rarely the case, or so small as to be easily overlooked, giving them a more strict appearance than they would otherwise have.

In this connection reference may be made to a letter, which accompanies the types, from Lesquereux to Sullivant, calling his attention to the discrepancies to be observed in *pl. 9*, 4, of the Pacif. R. R. Reports, suggesting that the lower figures represent quite closely his *Hypnum Bolanderi* and the upper something else. On the back of this letter Sullivant writes that while the four upper figures do represent his new species, *Hypnum leuconeurum*, the others are those of the true *Hypnum Whippleanum*, "which Lesquereux never saw!" It is difficult to decide whether Lesquereux was right in his contention or not, but one thing is certain: the figures to which Sullivant refers as the *true Hypnum Whippleanum* are not drawn with his accustomed accuracy.

3. CLAOPODIUM CRISPIFOLIUM (Hook.) R. & C.

Hypnum crispifolium Hook. Musc. Exot. 1818.

Hypnum ramulosum Hampe in Muell. Syn. Musc. 2: 486. 1851.

Claopodium crispifolium R. & C. Musc. Am. Sept. 50. 1892.

Thuidium crispifolium Kindberg in Cat. Can. Plants, 6: 186. 1892.

In spreading mats, rufescent below, yellow-green above; stems 5–8 cm. long, creeping, stoloniferous, closely pinnately branched; branches simple or pinnate, spreading, attenuate, paraphyllia few, squamiform, serrate; stem leaves densely imbricated, when dry crispate-incurved, when moist erect-spreading, incurved, abruptly contracted above a broadly ovate auriculate-cordate decurrent base, linear-lanceolate, crowded with a long serrate hyaline point; margins serrate-dentate, undulate-rugose; costa narrow, vanishing in the acumen; leaf-cells small, round-quadrate, stoutly unipapillate on both surfaces; branch leaves similar but smaller; perichetial bracts loose, scarious, oblong to oblong-lanceolate, abruptly long loricate-filiform acuminate, margins bordered below by a narrow band of rhombic-hexagonal cells, lightly costate; pedicel 2½–3 cm. long, tuberculate, capsule narrowly oval-oblong, horizontal; annulus of three rows of cells, deciduous; teeth pale yellow; segments open; cilia two to three; operculum conic, long rostrate; spores .011–.013 mm.; matures in spring.

On rocks, stones and the ground, from British Columbia (Macoun) southward to California (Howe) and eastward to Idaho (Leiberg).

Type locality, west coast of North America (Menzies). Type in the Hooker Herbarium at Kew!

ILLUST.—Hook. Musc. Exot. 1: *pl. 31.* 1818. Schwaeg. Supp. 2: pt. 1, *pl. 143.* 1824.

REM.—It is impossible to make satisfactory references to exsiccatae because of the confusion existing between *Hypnum ramulosum* and *H. crispifolium.* Generally speaking, those bearing the former name are *Claopodium Bolanderi,* but not invariably so. In the set at hand, no. 405 S. & L. Musc. Bor. Am., Ed. 2, is this species. Macoun Can. Musc. no. 275, in two sets, is *C. crispifolium.*

4. CLAOPODIUM BOLANDERI n. sp.

In thin spreading mats, rufescent below, green above; stems 3–5 cm. long, creeping, stoloniferous, pinnately branched; branches simple, spreading, turgid, paraphyllia small, squamiform, serrate; stem leaves loosely imbricated, when dry crispate-incurved, when moist erect-spreading, incurved, contracted above a broadly ovate or triangular subauriculate-cordate decurrent base, lanceolate, crowned by a long serrate hyaline point, margins crenulate-serrulate, costa vanishing in the acumen; leaf-cells quadrate-hexagonal, indistinct, thickened-pluripapillate on both surfaces, papillae small, rounded, 2–5 to each cell; branch leaves smaller, ovate-lanceolate, hair pointed; perichetial bracts erect-spreading, flexuous, oblong-lanceolate, long loricate-filiform, acuminate, bordered below by a narrow band of irregular cells; pedicel 1½–2 cm. long, tuberculate; capsule short, broadly oval to suborbicular; annulus broad, deciduous; teeth pale yellow; cilia two to three, usually poorly developed; operculum conic-rostrate; spores .010–.012 mm.; matures in late winter or early spring.

On rocks, stones, rarely on the ground, from Alaska (J. M. Macoun) southward to California (Bolander) and eastward to Idaho (Leiberg).

Type locality, Marin Co., California (Bolander). Type in the Herbarium of Columbia University!

REM.—A less developed form of the preceding but easily separated from it by its smaller size, pluripapillate leaf-cells, shorter pedicel, shorter and broader capsule and imperfect cilia. The leaves are usually not so abruptly contracted above the base, broadly ovate-lanceolate, the margins not rugose.

Comparisons kindly made by Mr. Gepp, of the British Museum, verify the statement of Renauld & Cardot* as to the identity of *Hypnum ramulosum* Hpe. and *H. crispifolium* Hook., the types of both being unipapillate. The type of *Leskea laxifolia* Hook. (*H. laxifolium* Schwaeg.), loaned Mrs. Britton by the authorities at Kew, is *Brachythecium reflexum* (W. & M.) Br. & Sch.

ROSEMONT, N. J.

Mesophyl of Ferns.

BY MARY ELGIN GLOSS.

While making a comparative study of the chlorophyl bearing cells of plants, including ferns, I noticed what appeared to me to be a marked resemblance between the sections of the leaves of two species of *Adiantum*. As some species of *Nephrolepis*, *Dryopteris*, and *Polypodium* show also peculiarities of structure characteristic of each genus, I have tabulated the results of observations made from February to May, 1897.

A study of the mesophyl of ferns made from material from the greenhouses near Evanston, and from the Missouri Botanical Garden, affords some characteristic differences and resemblances. In the species studied these seem to give a means of distinguishing one genus from another, as the presence of chlorophyl in the epidermis, the form and arrangement of the cells of the mesophyl, the size of the air spaces, the number of cells in thickness of the mesophyl, the presence of palisade tissue, and the number of cells in its depth, seem to be constant through a genus.

Species were examined from the following genera: *Adiantum*, *Dryopteris*, *Asplenium*, *Nephrodium*, *Nephrolepis*, *Polypodium*, *Pteris*, *Scolopendrium*, and *Blechnum*. The sections were cut perpendicular to the smaller veins of the fresh frond, and the comparison

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* Musc. Am. Sept. 50. 1892.